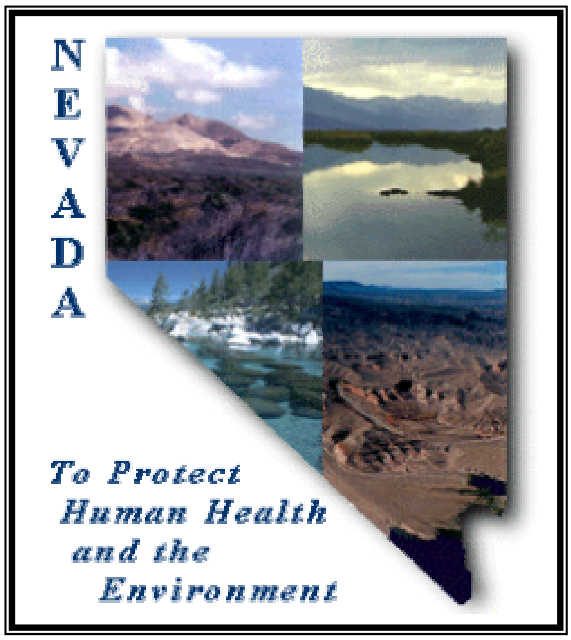
APPENDIX C

INCREMENT TRACKING SYSTEM QUICK GUIDE



Increment Tracking System Quick Guide

Assessing PSD Increment in the Fernley Area and Truckee River Corridor

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1.0 INCREMENT TRACKING SYSTEM

The Increment Tracking System (ITS) is a database and geographic information system (GIS) desktop application that permits access to major and minor source baseline information, annual emissions data, and permitted emissions data. The ITS combines the relational database capabilities of Microsoft Access 2000 (Access) with the spatial analysis capability of ArcView to provide the Bureau of Air Pollution Control (BAPC) and Bureau of Air Quality Planning (BAQP) a desktop application that will improve the current method of storing, maintaining, retrieving, and presenting emissions data. Additionally, the ITS generates AERMOD model input data for use in modeling, using user defined parameters, and imports, stores, and presents AERMOD output files to provide BAPC and BAQP a method of archiving and reviewing results from model runs. The ITS provides users with a user-friendly graphical user interface (GUI) for entering data, querying data, generating model input data, and reporting capabilities. ITS users can view and query data using the GIS interface or the database interface.

1.1 SYSTEM DESCRIPTION

The ITS is composed of two major components, a relational database component and a GIS component. The relational database component is an Access database. The GIS component is ArcView. Whenever possible, the components share rather than independently store data. For example, facility information, such as location and ownership, presented on maps in the ArcView component of the ITS, uses tables and data stored in the Access database. At the time the ArcView application is started, it connects to the Access component using open database connectivity (ODBC). The ArcView component queries an Access table for locations, reads those locations, and presents facilities on the GIS map based on the coordinates and information in the Access table. Using an ODBC connection minimizes the chances of update errors occurring. Update errors can occur when data are stored in more than one location and updates are not made consistently to both databases. Storing data in one location prevents this type of data inconsistency.

The ITS was designed so that a user could use only the Access component, only the ArcView component, or both components simultaneously. Because the ArcView component of the ITS uses Access data, it is imperative that the Access component be available to the ArcView component. If for any reason the Access component is removed from its pre-defined location on the system, the ArcView component will not operate as desired. However, the Access component need not be opened or executed for the ArcView component to obtain data from it. Conversely, the Access component can operate independently of the ArcView component if the user does not require a map-based interface.

1.2 SOFTWARE SELECTION

1.2.1 Microsoft Access

Access is the relational database component of the ITS. This desktop database application software was selected because of its ability to accommodate several concurrent users, the ability of ArcView to access its data tables, and because it is a 'standard' in desktop relational database management systems (RDBMS). Additionally, Access can be customized to tailor an application to specific user needs, and it can accommodate the type and volume of data used in tracking increment consumption.

The customization of Access for the ITS included the creation of data selection screens tailored to increment consumption and emissions data, data viewers that organize data for review, and report generators. These reports are created in Access report format and American Standard Code for Information Interchange (ASCII) files for use in AERMOD. ITS users that are familiar with Access and relational databases can open data in tabular form to view emissions data and data table relationships, and to execute their own data queries.

1.2.2 ArcView

ArcView is the GIS component of the ITS. This desktop GIS software was selected because it is the industry leader in desktop GIS software and provides powerful data visualization, query, and analysis functions. Additionally, ArcView can combine with Microsoft Access to allow users the ability to create and edit geographic data. The customization of ArcView for the ITS included the creation of buttons to consolidate frequently occurring command sequences into one button click or menu selection, and GUIs to guide users to emissions data and hydrographic areas (also known as basins) and streamline data accessibility. Additional enhancements to ArcView allow it to execute the Access component of the ITS and to use data stored in it. The spatial data model used by ArcView is a standard geographic data model and is common to the spatial data used by NDEP and BAPC and BAQP.

1.3 DATABASE ADMINISTRATION AND IMPLEMENTATION PROCEDURES

1.3.1 Database Requirements

Installation of the ITS will require that BAPC and BAQP install the application in the correct location on their system. It is essential for the GIS application functionality that all files remain in the correct directory. Removing files from this directory will cause the application to fail.

1.3.1.1 Software Requirements

Microsoft Access 2000 is the required version of Access. Earlier versions of Access will not support the ITS. The GIS software required by the ITS is ArcView 3.2. ArcView 3.2 applications will not convert to the recently released ArcView 8.x. Migrating the GIS component of the ITS to ArcView 8.1 will require significant modifications to the application.

1.3.1.2 Hardware Requirements

A system capable of running Microsoft Access and ArcView will be required to operate the ITS. The following system requirements are minimum requirements. Additional processing speeds, random access memory (RAM), and disk space will enhance application performance.
Minimum hardware requirements for the ITS:

- Personal Computer (PC) with a Pentium 300 megahertz (MHz) or higher processor
- Microsoft Windows® 95 or newer operating system, or Microsoft Windows NT® Workstation operating system version 4.0 Service Pack 3 or newer
- 64 megabytes (MB) of RAM
- Approximately 400 MB of available hard-disk space for Microsoft Access and ArcView and approximately 75 MB for the ITS and supporting data (disk space requirements can be on a network drive, local drive, or a combination of network and local drives.)
- CD-ROM drive
- VGA or higher-resolution monitor; Super VGA recommended
- Microsoft Mouse, Microsoft IntelliMouse®, or compatible pointing device

1.3.1.3 User Expectations

To operate the ITS effectively, users should have a working knowledge of Access and ArcView. The application does contain specific GUIs designed to aid in the retrieval and presentation of data. It is likely that inexperienced users using these GUIs will be able to use the application successfully. However, skills in both Access and ArcView will allow users to draw on the additional functionality of both softwares.

1.3.2 Data Acquisition and Data Formatting

1.3.2.1 Paradox Data

Emissions and permitting data for the 'current' year (1998 or 1999) were received from BAPC and BAQP in a Paradox database. Emissions and permitting data were imported into the Access 2000 database and were mapped to the ITS data table structure. The Access component of the ITS uses BAPC and BAQP's Paradox database structure as its foundation. Facility, system, and emissions data are stored in tables similar in design and content to the table structure found in the Paradox database. Only slight modifications were made to the Paradox structure. For example, emission unit data was incorporated into the control and System information. All FacSeq, FacilityID, System#, and Control# keys from Paradox were retained in order to maintain data relationships with the original data.

An entity relationship diagram presenting the ITS database structure is shown in Figure 1.

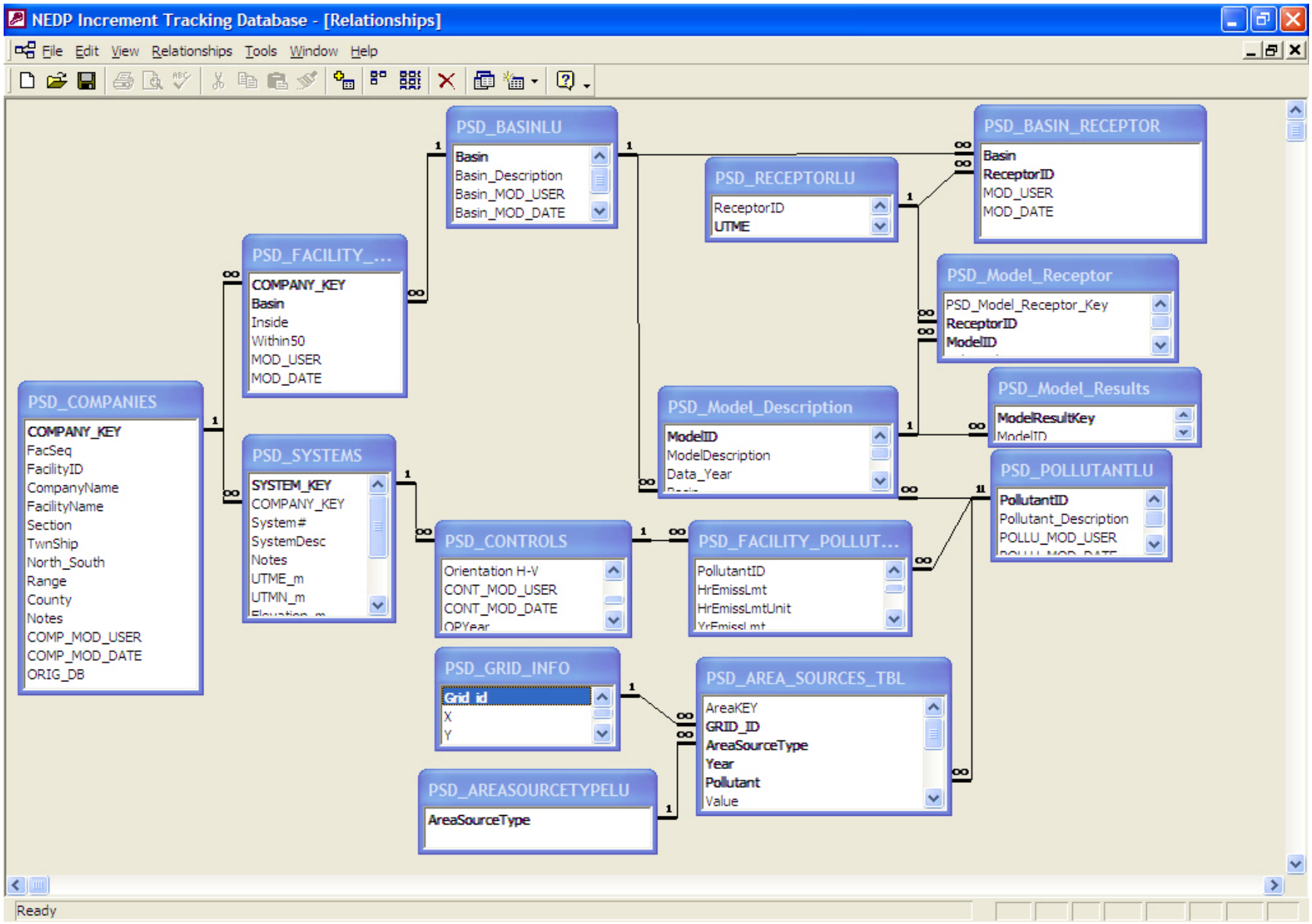
1.3.2.2 National Emissions Trends Data

No area source data was included in the BAPC and BAQP paradox database. National Emissions Trends (NET) data were acquired and apportioned to areas using methods described in the emissions inventory section of this document. Apportioned NET data are stored in the PSD_Area_Sources_Table table in the Access 2000 database.

1.3.2.3 Researched Data

Stationary and area source baseline data are also include in the ITS. These data are stored the same tables as 'current' data and are identified by year and pollutant.

FIGURE 1
ACCESS DATABASE ENTITY RELATIONSHIP DIAGRAM



1.3.2.4 Spatial Data

The spatial data presented in the ArcView component of the ITS is in the shapefile format. Spatial data were obtained from BAPC and BAQP and from other government agencies, including the U.S. Census Bureau and the U.S. Geological Survey (USGS). The spatial data presented in the ArcView component of the ITS is referenced to the Universal Transverse Mercator (UTM) projection, Zone 11. The project datum is North American Datum of 1983 (NAD83) and the horizontal units are meters. Data were obtained in this projection or converted to UTM zone 11, NAD83 using established GIS techniques.

The facility location theme (Facilities) is created dynamically from data in the Access component of the ITS. ArcView connects to the Access table, PSD_Companies_GIS, using ODBC and uses the UTM coordinate data for each facility to place the facilities on the ArcView maps.

1-kilometer (km) area source grid themes were created using GIS techniques to cover each of the three hydrographic areas. The area source grids are a static dataset. The attributes or characteristics of the area grids are stored in the Access table PSD_area_source_GIS_Table. When the application starts, area source data from the Access component of the ITS is liked to the 1km by 1km spatial data set for presentation. Receptor point locations were also created using GIS techniques at a 500-meter spacing.

See Attachment A for GIS metadata of the themes included in the ArcView component of the ITS.

1.3.3 Data Entry and Quality Control Procedures

1.3.3.1 Paradox Data

Current data from the state of Nevada was received in the form of a Paradox database. Relevant data was imported into the Access2000 database and brought into the PSD study's database structure. The original tables imported from paradox were kept in the database during development for easy checking and to ensure all the data was properly imported into the new tracking system structure. All FacSeq, FacilityID, System# and Control# keys from paradox were retained so that linking back to the Paradox database could be performed if necessary. Keeping this key information would also ease importing any data or fields that were in the original Paradox database that were not needed for the tracking system. For instance, contact information and fee payment information were in the original database but were not needed for the tracking system. The database was designed in such a way that this data could be easily added to the tracking system later on if necessary.

1.3.3.2 Spatial Data

As previously mentioned, facility location data was derived from the BAPC and BAQP's paradox database and was imported into the Access component of the ITS. The ArcView component of the ITS dynamically references this table and locates the facilities based on their UTM coordinates. As part of the database quality control process, the facilities were plotted on USGS topographic quad sheets and reviewed to insure that they were properly positioned.

Spatial data that was collected from government sources was not checked for accuracy as these data are subject to review procedures by their government source.

Area grids and receptor locations created using GIS techniques were presented on maps and were reviewed by air dispersion modelers to confirm their locational accuracy, as well as their impact on model runs.

1.4 APPLICATION DATA RETRIEVAL AND USE

1.4.1 Queries

The ITS application contains queries that create tables used by both the Access and ArcView components of the system. AERMOD input files and user reports can then be created from subsequent queries. Many queries created for the application are not seen by the user. However, they can be added to the selection screen or accessed through the back end if they appear useful. See Attachment B for a list of these queries.

1.4.2 Reports

Several types of reports can be created from the data in the Access database. These reports are summarized below.

Facility Information Reports: Facility information reports can be accessed through the reports form of the application by selecting the appropriate radio buttons. To create a report for one facility select **View Summary Report for a Selected Facility** (Figure 2) and then select a facility from the pick list on the right and click **Preview Report** at the bottom of the form. The report that is returned shows the details of the facility's systems and controls, including emission data (Figure 3). Company, system, and control information are organized hierarchically in the report. To create a similar report for all of the facilities in the database, select the radio button **Summary Report for all Companies** and click **Preview Report** at the bottom of the form (Figure 4).

FIGURE 2
CREATE FACILITY INFORMATION REPORTS

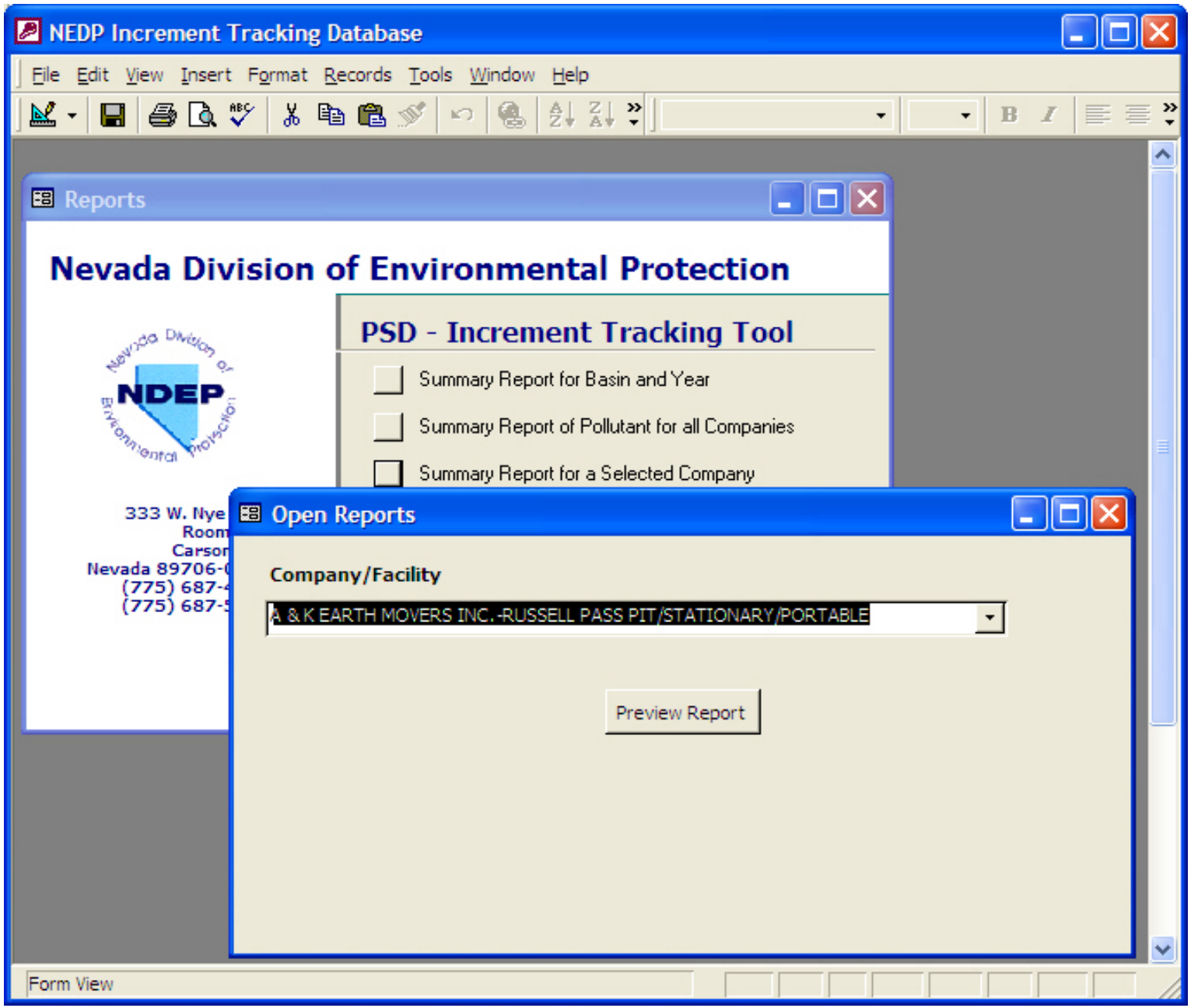


FIGURE 3
FACILITY INFORMATION REPORT

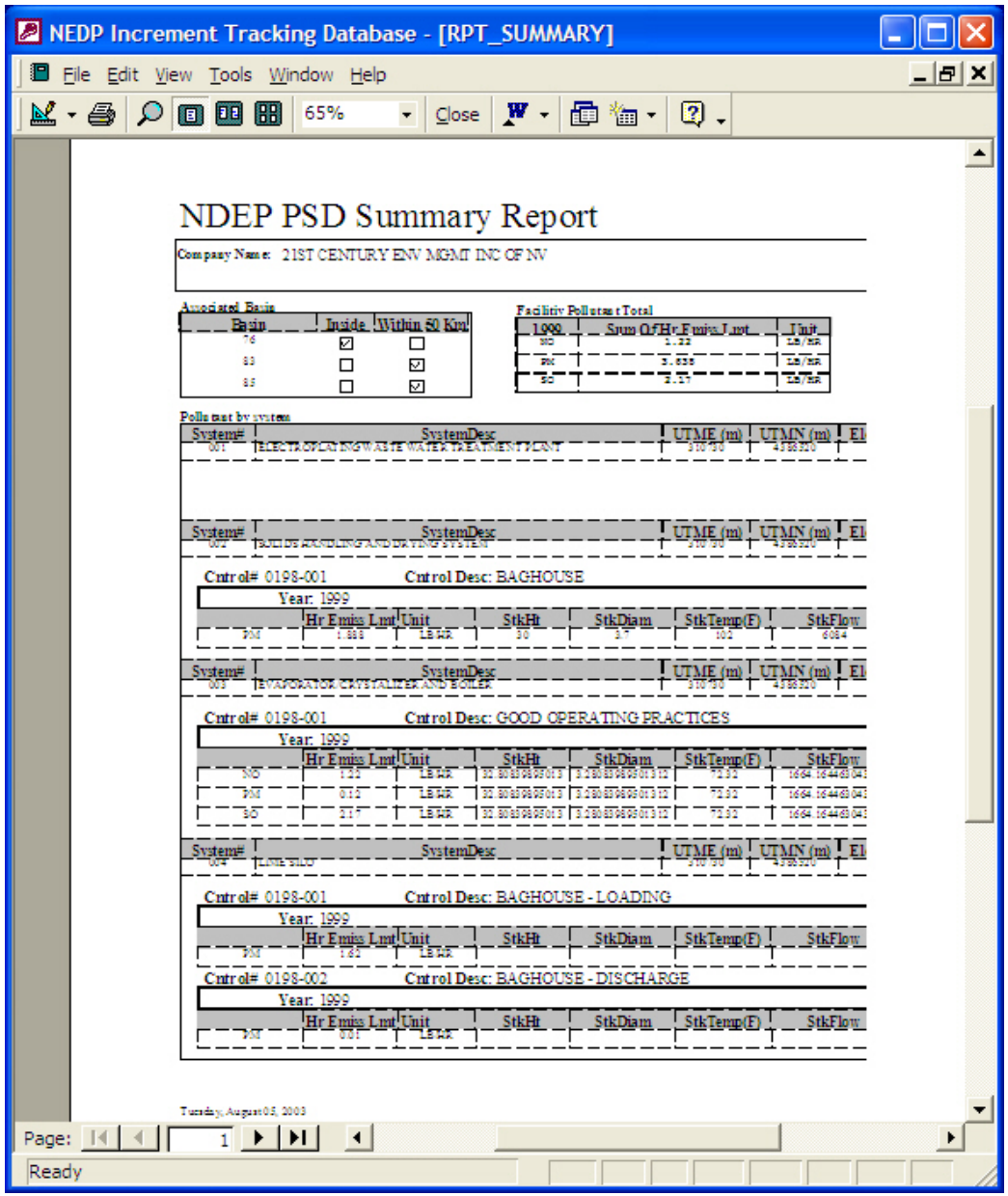
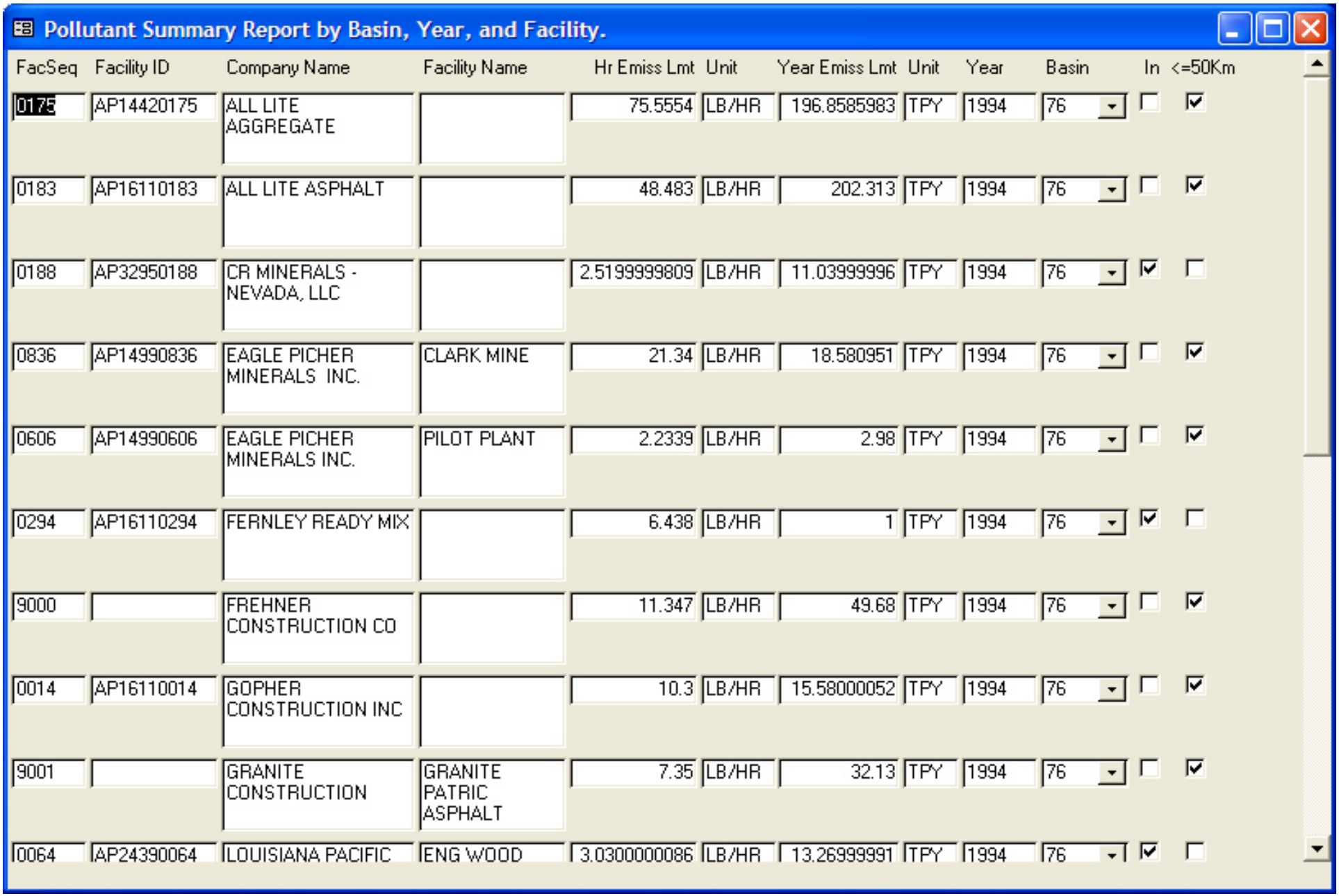


FIGURE 4
SUMMARY REPORT



Pollutant Summary Report by Basin, Year, and Facility.

FacSeq	Facility ID	Company Name	Facility Name	Hr Emiss Lmt	Unit	Year Emiss Lmt	Unit	Year	Basin	In	<=50Km
0175	AP14420175	ALL LITE AGGREGATE		75.5554	LB/HR	196.8585983	TPY	1994	76	☐	☑
0183	AP16110183	ALL LITE ASPHALT		48.483	LB/HR	202.313	TPY	1994	76	☐	☑
0188	AP32950188	CR MINERALS - NEVADA, LLC		2.5199999809	LB/HR	11.03999996	TPY	1994	76	☑	☐
0836	AP14990836	EAGLE PICHER MINERALS INC.	CLARK MINE	21.34	LB/HR	18.580951	TPY	1994	76	☐	☑
0606	AP14990606	EAGLE PICHER MINERALS INC.	PILOT PLANT	2.2339	LB/HR	2.98	TPY	1994	76	☐	☑
0294	AP16110294	FERNLEY READY MIX		6.438	LB/HR	1	TPY	1994	76	☑	☐
9000		FREHNER CONSTRUCTION CO		11.347	LB/HR	49.68	TPY	1994	76	☐	☑
0014	AP16110014	GOPHER CONSTRUCTION INC		10.3	LB/HR	15.58000052	TPY	1994	76	☐	☑
9001		GRANITE CONSTRUCTION	GRANITE PATRIC ASPHALT	7.35	LB/HR	32.13	TPY	1994	76	☐	☑
0064	AP24390064	LOUISIANA PACIFIC	ENG WOOD	3.0300000086	LB/HR	13.26999991	TPY	1994	76	☑	☐

1.4.3 Tables

The tables that reside in the ITS database were either created by importing data from the BAPC and BAQP's original Paradox database, or were created from researched data. Additionally, some tables were created to provide derived or intermediate information from the original data. The tables in the ITS remain mostly "hidden" from the user by the forms set up to provide a user-friendly GUI. However, users familiar with Access can easily view data in the tabular form if preferred. The tables included in the database are summarized in Attachment C.

1.4.4 Creating AERMOD Input Files

A file for source input into AERMOD can be generated from the database application. From the main selection screen choose **AERMOD and Receptors,** then choose **Generate AERMOD Input (**Figure 5). Next, choose a basin, year, and pollutant to model. Press the **Open** button and a new window will open that has fields containing information that will be used as comments in your input file, as well as to name the AERMOD input file. Fill in or change the existing information in these fields as preferred. Press the **Next** button at the bottom of the screen to continue creating the output file. The model input file will automatically include all major and minor sources within the selected basin and any major sources (greater than 250 tpy) within 50-km of the basin. At this point the model input file can be viewed in Notepad by choosing **View** from the bottom of the form.

1.4.5 Modifying Receptor Sets

The user can modify receptor sets by selecting the radio button **Add and Edit Receptor**. A table with a listing of all receptors in the chosen basin will open (Figure 6). The user can add, edit, or remove receptors used for the model here. The receptors used for a particular model run are retained in the database. This allows for a model input file to be generated at any time as well being able to view any model's results graphically in ArcView or in a table format in the Access application.

1.4.6 Importing Model Results

To import model-run results, select the radio button **Import Model Results** from the model results form. Users must enter a correct file path and name in the field "File Path and File Name". Then users need to select a correct Model. If the Model is not in the database, users can click the button **Edit Model** to add a new model and its receptors. Users must select a term, such as 3-Hour, 24-Hour, or annual for the model results they need to import. Then, users can click the button **Step One** and review the model results in a text editor. If the text file looks correct, users can click the button **Step Two** to import the results into the database.

FIGURE 5
CREATE AERMOD INPUT FILES

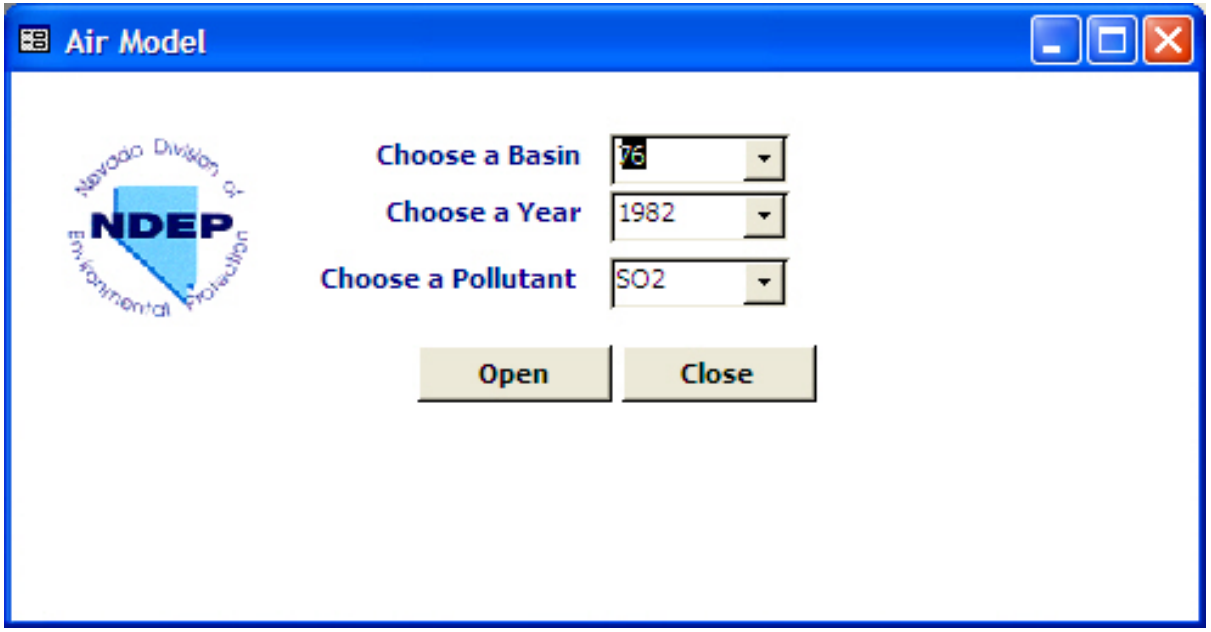
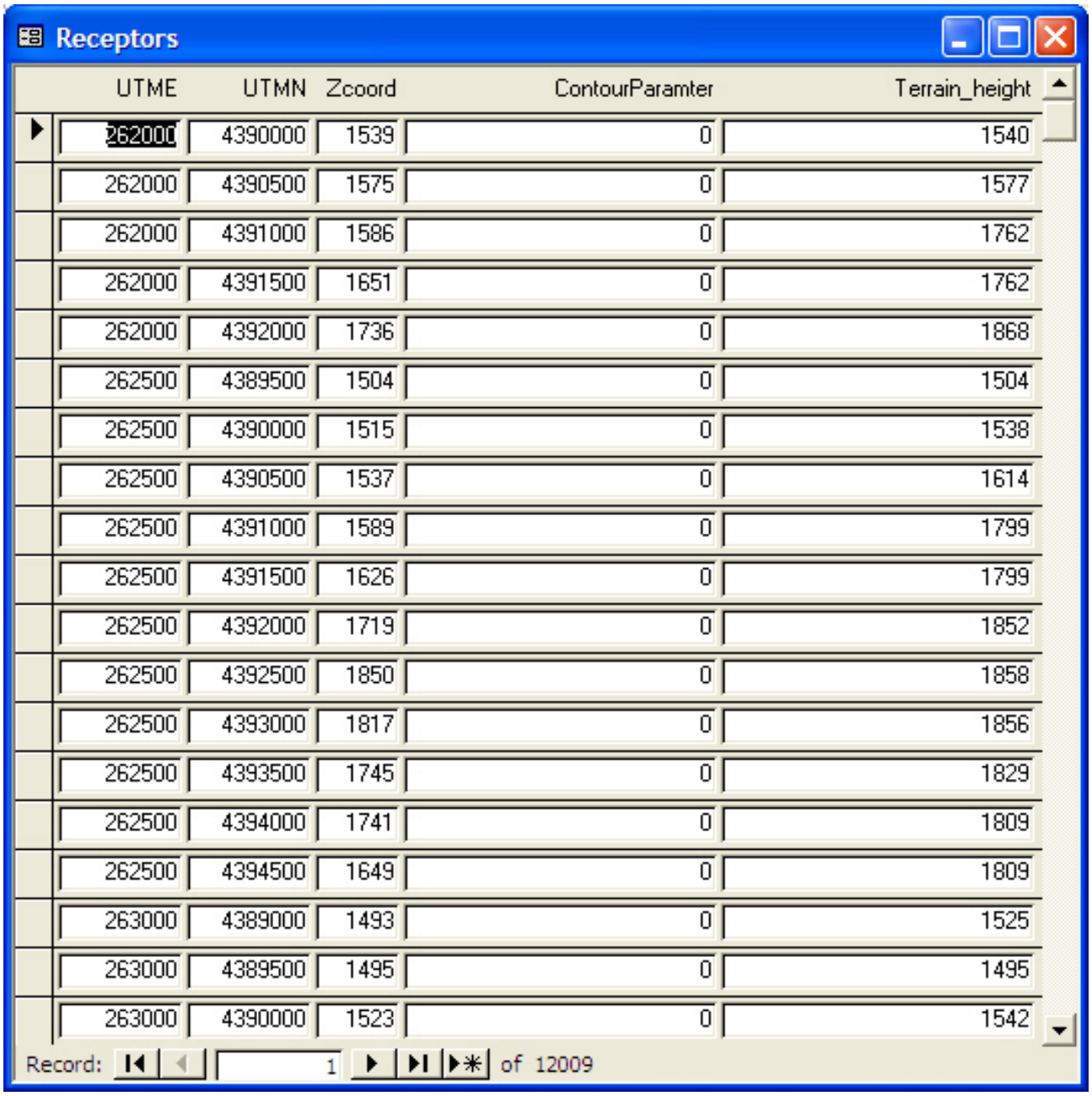


FIGURE 6
MODIFY RECEPTOR SETS



1.4.7 Adding and Editing Facility Data

To add a facility to the Access component of the ITS, choose the radio button option **Add and Edit a Facility**. A data entry form will open that shows data for the first facility recorded in the database. On the bottom of the screen, scroll through the facility records until a blank form appears where facility information can be added (Figure 7). This form will be located as the last record. Facilities, systems and controls can be added using this blank form. If a facility already exists in the system, the user can edit its data by scrolling through the facility records until the desired facility appears on the screen (Figure 8).

1.5 GEOGRAPHIC INFORMATION SYSTEM

1.5.1 Spatial Database Design

The ArcView component of the ITS is organized into maps or views, one for each of the study hydrographic areas. Each of these views can be accessed when starting the ArcView component of the ITS. An example of a basin selection screen is presented in Figure 9. A custom button has been added to ArcView to allow the user to easily switch between basins. Alternatively, the user may select basins by using standard ArcView window navigation techniques.

Each hydrographic basin view includes the base map themes for the area, the area 1-km grid cells and receptor points, and the Facilities theme. These themes may be turned on or off using standard ArcView functions.

All GIS base map data is stored in one directory called *'incrementtracking/GIS'*. The data is stored in ArcView shapefile format. The Facilities and Receptors themes are created dynamically from the PSD_Companies and PSD_ReceptorLU tables in the Access component of the ITS. These themes and attribute data for the areas sources is refreshed each time the ITS is started, after the user returns from opening or making changes in Access, and manually by the user by pushing the **Refresh Access Data** button.

1.5.2 Spatial Data Acquisition and Formatting

The spatial data for the ITS was acquired from several sources, including the State of Nevada, the USGS, and the Census Bureau. All spatial data was converted to ArcView shapefile format and metadata was created for each theme (see Attachment A).

FIGURE 7
ADD A NEW FACILITY

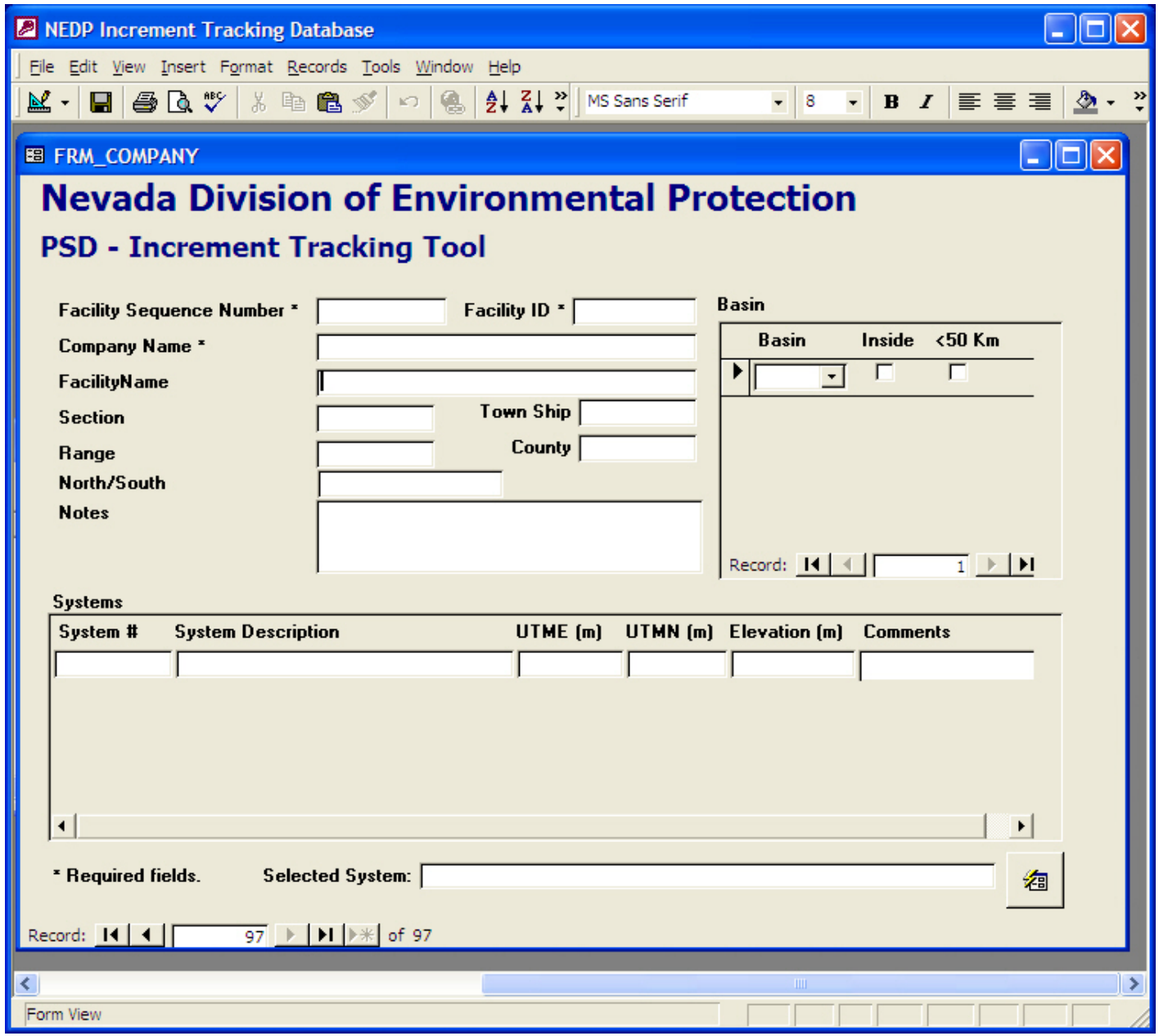


FIGURE 8
EDIT AN EXISTING FACILITY

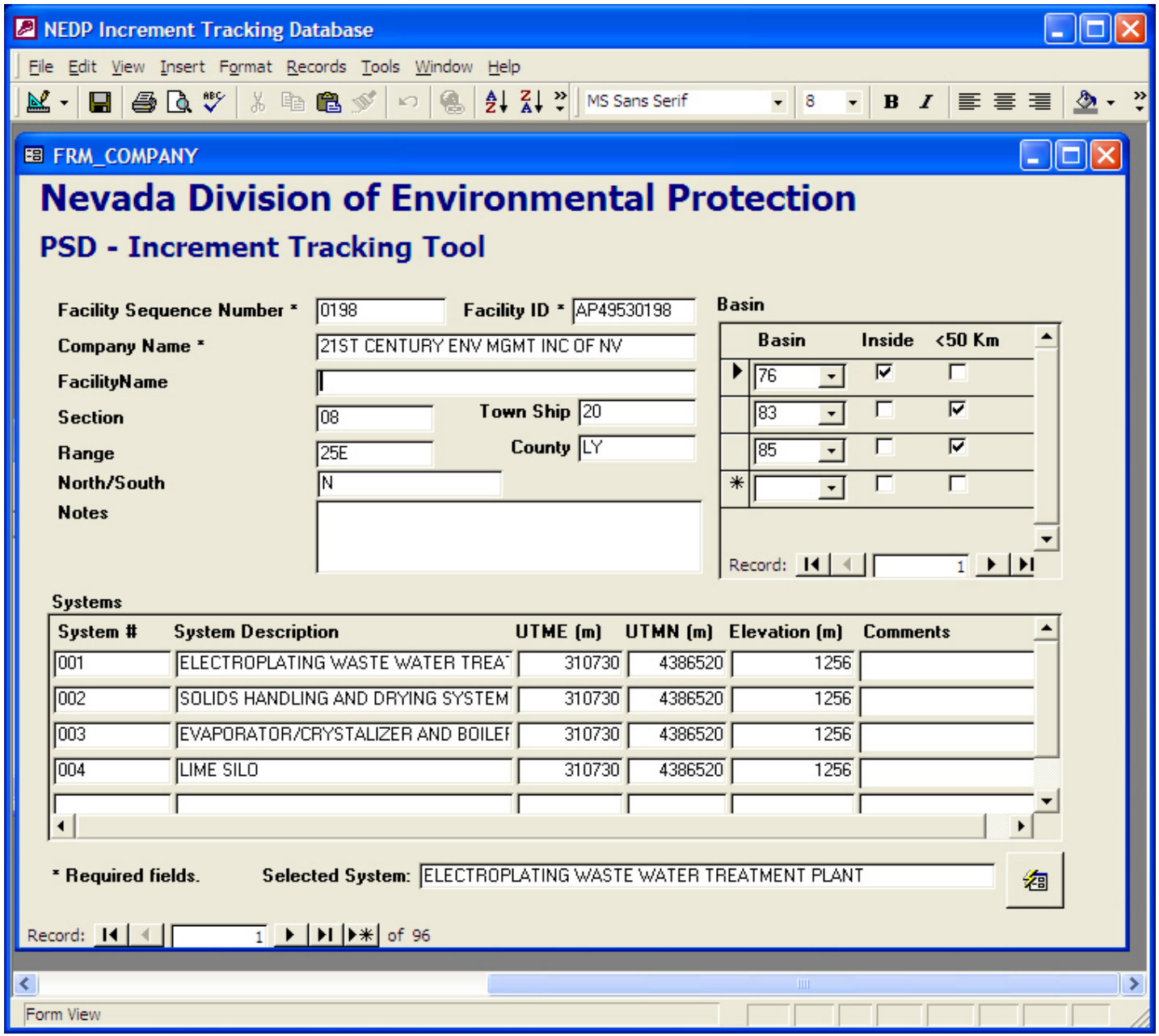
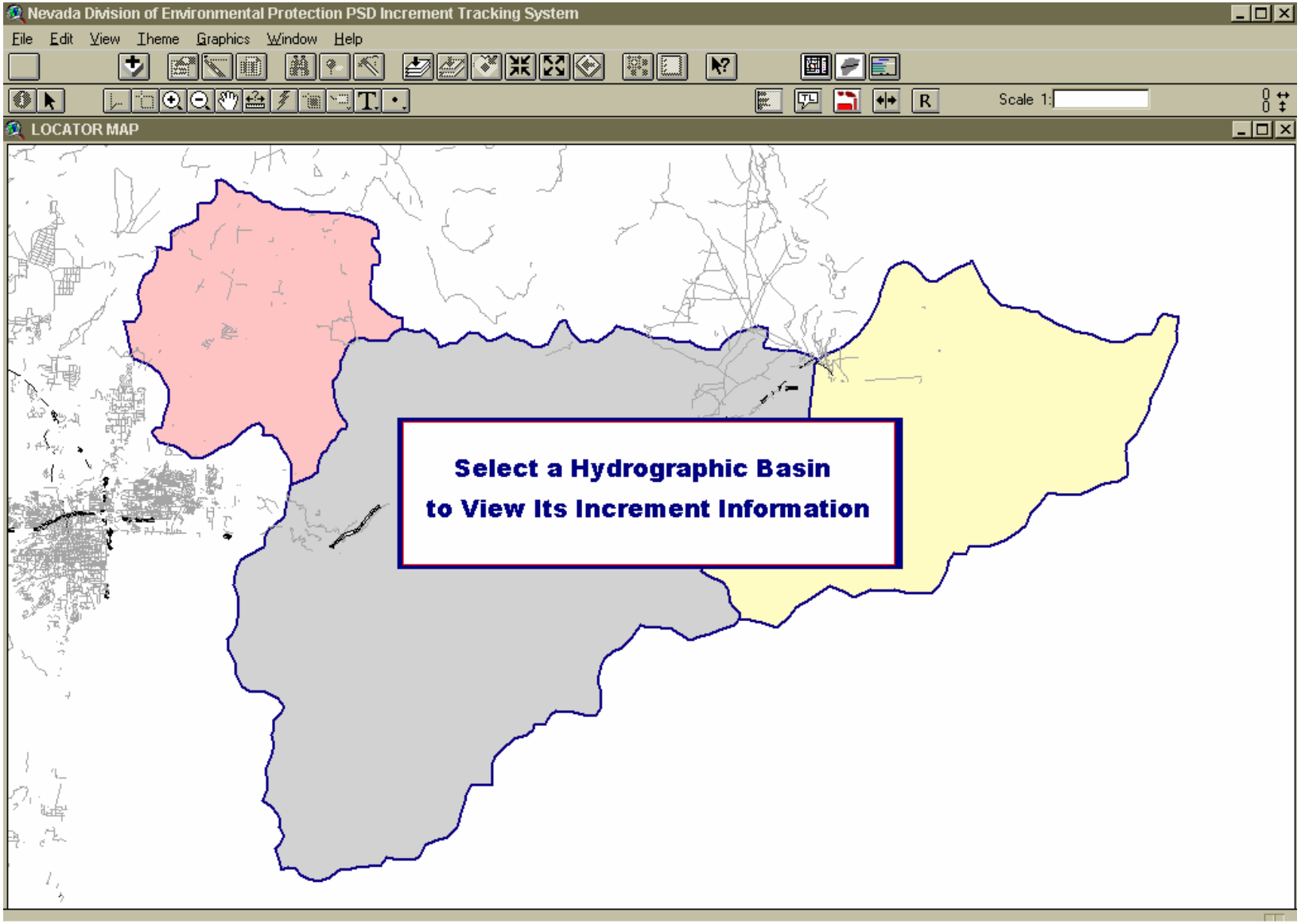


FIGURE 9
BASIN SELECTION SCREEN



1.6 ARCVIEW GIS DATA RETRIEVAL AND USE

1.6.1 Presenting Data Graphically

The spatial data for each hydrographic area is organized and symbolized for the user in a default presentation. The user may use standard ArcView techniques to modify this presentation or to create additional graphic displays of the data. Shaded classification maps of emissions data for each 1-km area grid can be created automatically by selecting the **Map Area Results** button (Figure 10). When the user clicks this button they are is prompted to choose total, vehicular, railroad, or miscellaneous area source emissions to the map. When the map is created, the user can modify the symbology using standard ArcView legend editor capabilities.

All data presented on a map can be included in a map composition or layout. To create a custom layout, click the **Create Custom Map Layouts** button and a new layout based on the features visible in the map view will be created. In addition to the spatial data, the map will include a user defined title, automatically accurate scalebar, north arrow, and NDEP logo.

1.6.2 Presenting Attribute Data in Reports or Facility Attribute Boxes

To create a text report of attribute data for any feature, click on the **Create Report of Attributes** tool and then click the feature in an active theme that you want a report for. A text report will be created and Windows Write will open it (Figure 11). This report can be printed, or saved to a new file.

Selecting the **Create Facility Information Boxes** tool creates facility attribute boxes for display on a map. Instructions for using this tool will appear in a message box after you select the tool. After you have drawn a leader line from the feature for which you want to create a box, you will be prompted to choose fields to include in the information box. Data for all facility systems and controls found at this location will be presented in a table connected to the feature by a leader line (Figure 12).

1.6.3 Viewing Model Results

Model results stored in Access can be mapped in the ArcView component of the ITS. Click on the button **Map Model Results** (Figure 13) and choose a set of previously entered model results. A new ArcView theme with each receptor used in the model will then be added to the view. Select **Yes** to create contours, or **No** to end.

FIGURE 10
MAP AREA RESULTS

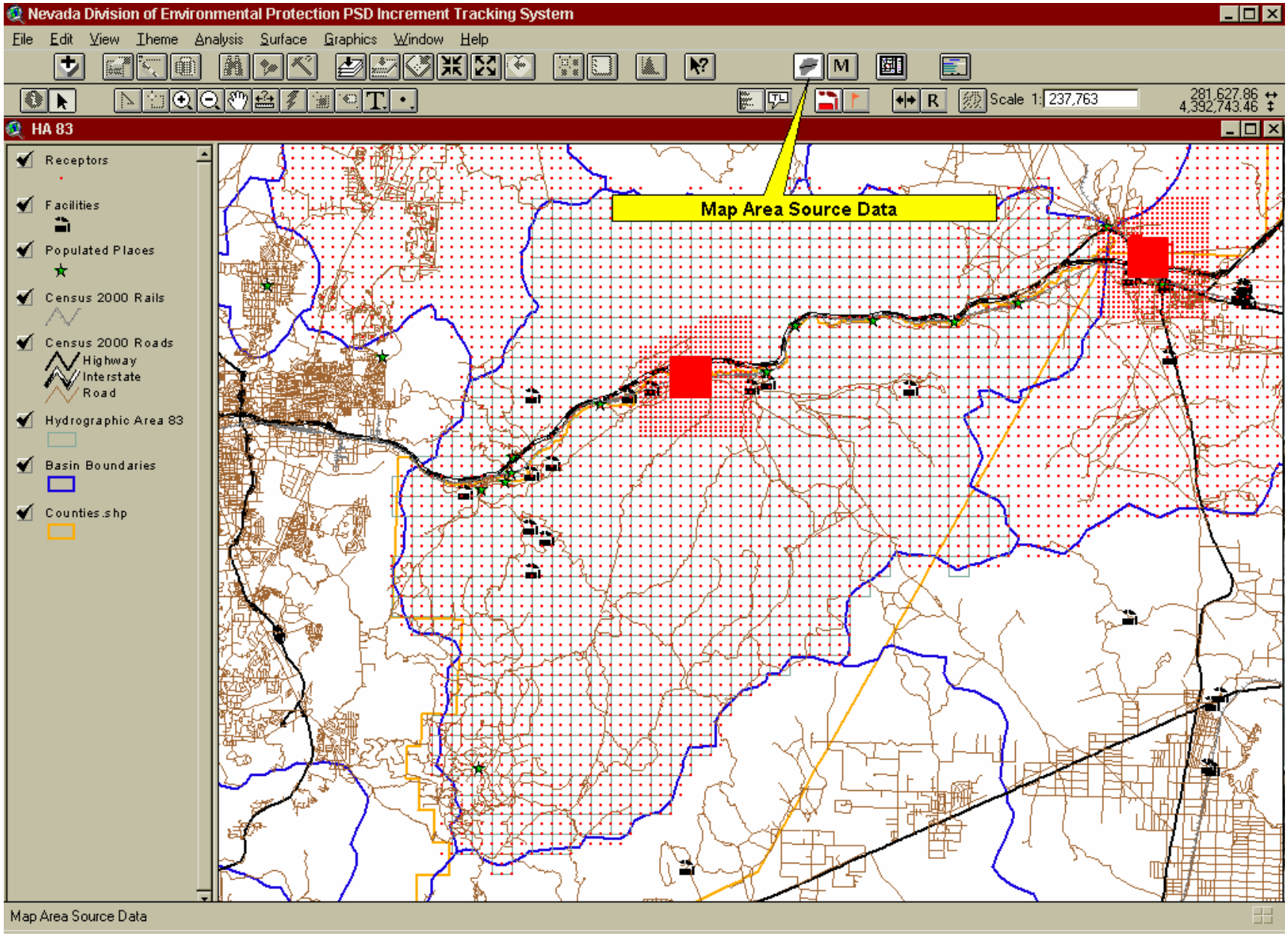


FIGURE 11
CREATE A REPORT OF FEATURE ATTRIBUTES

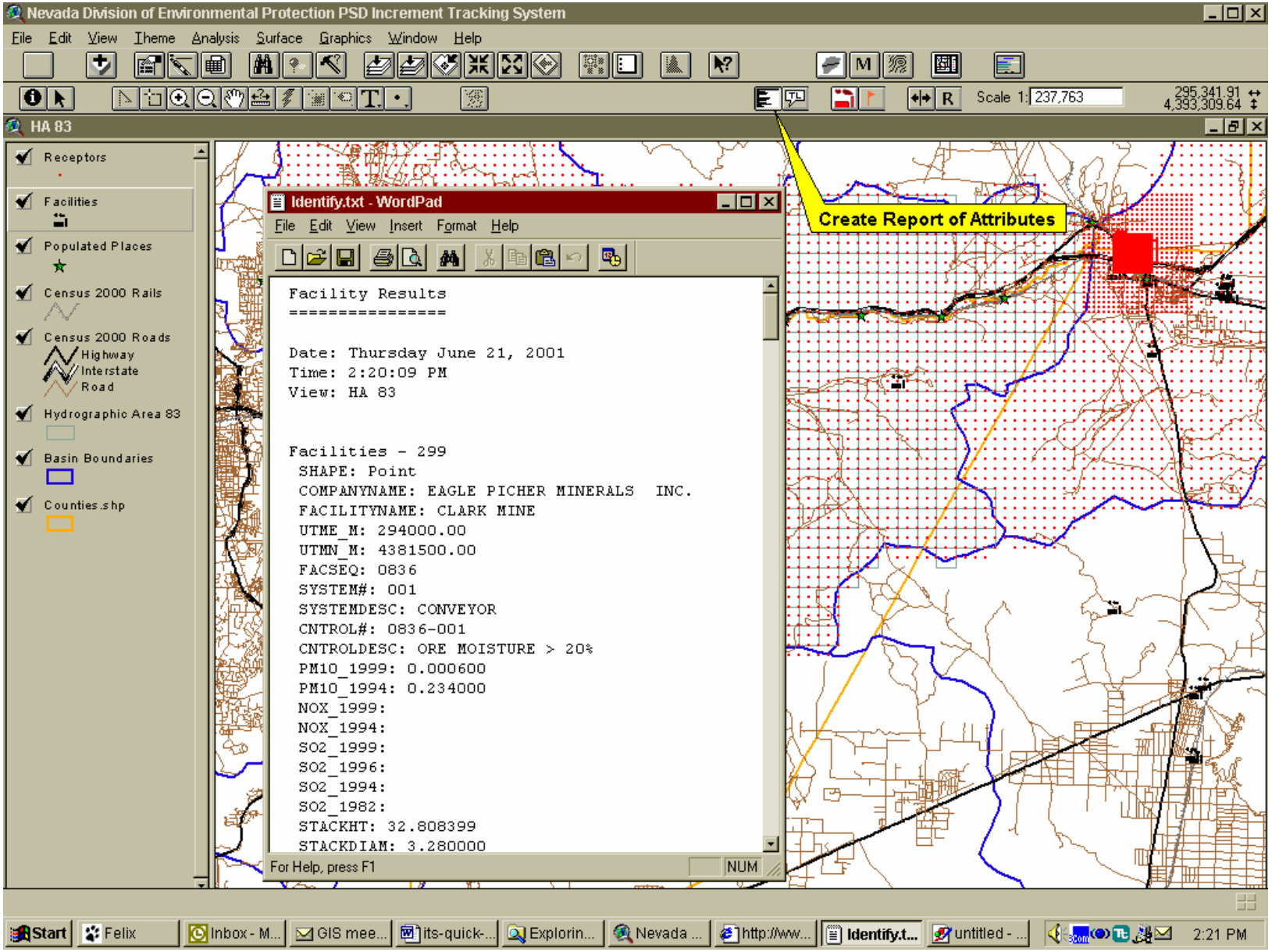


FIGURE 12
CREATE FACILITY ATTRIBUTE BOXES FOR MAP DISPLAY

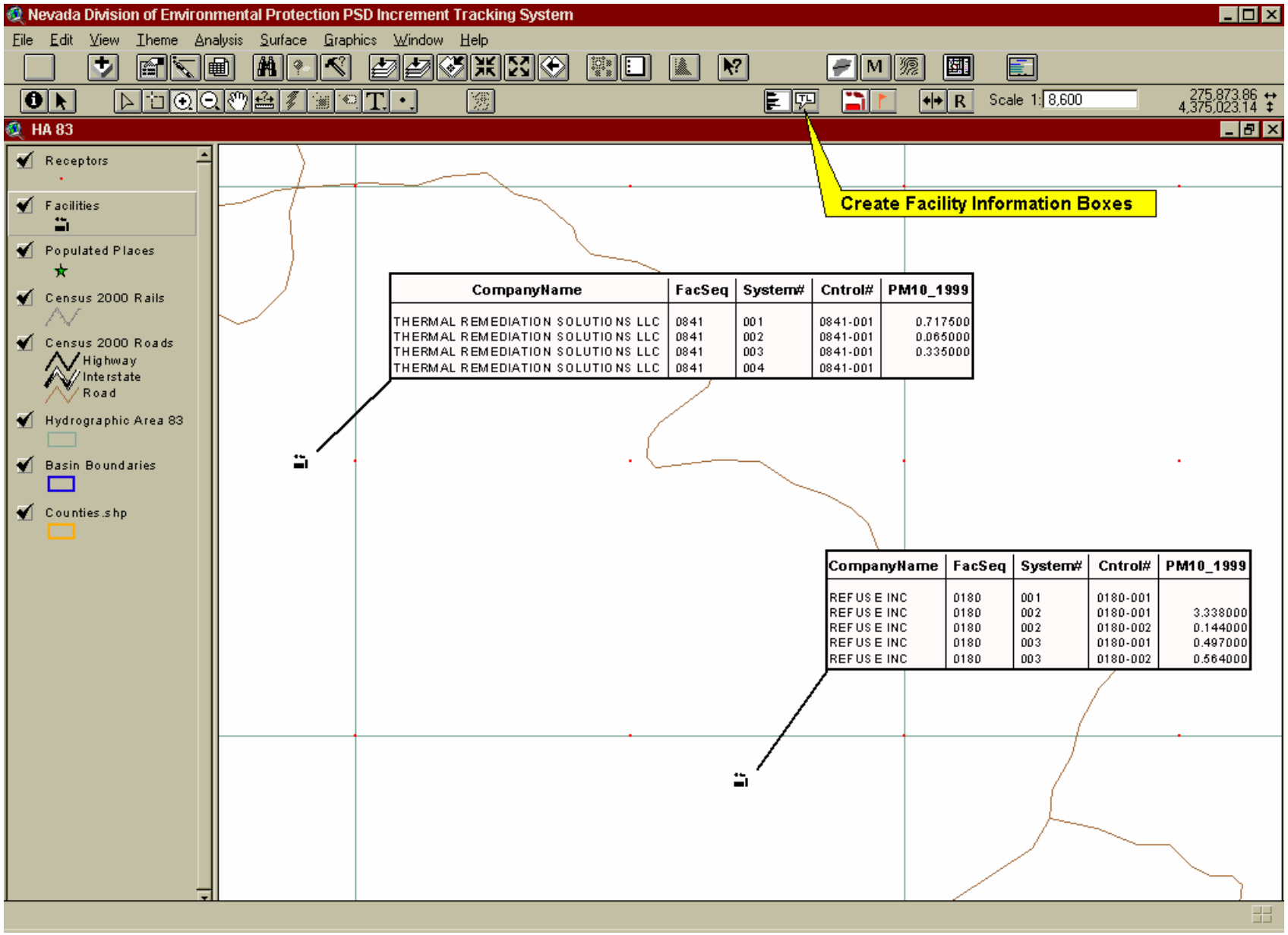
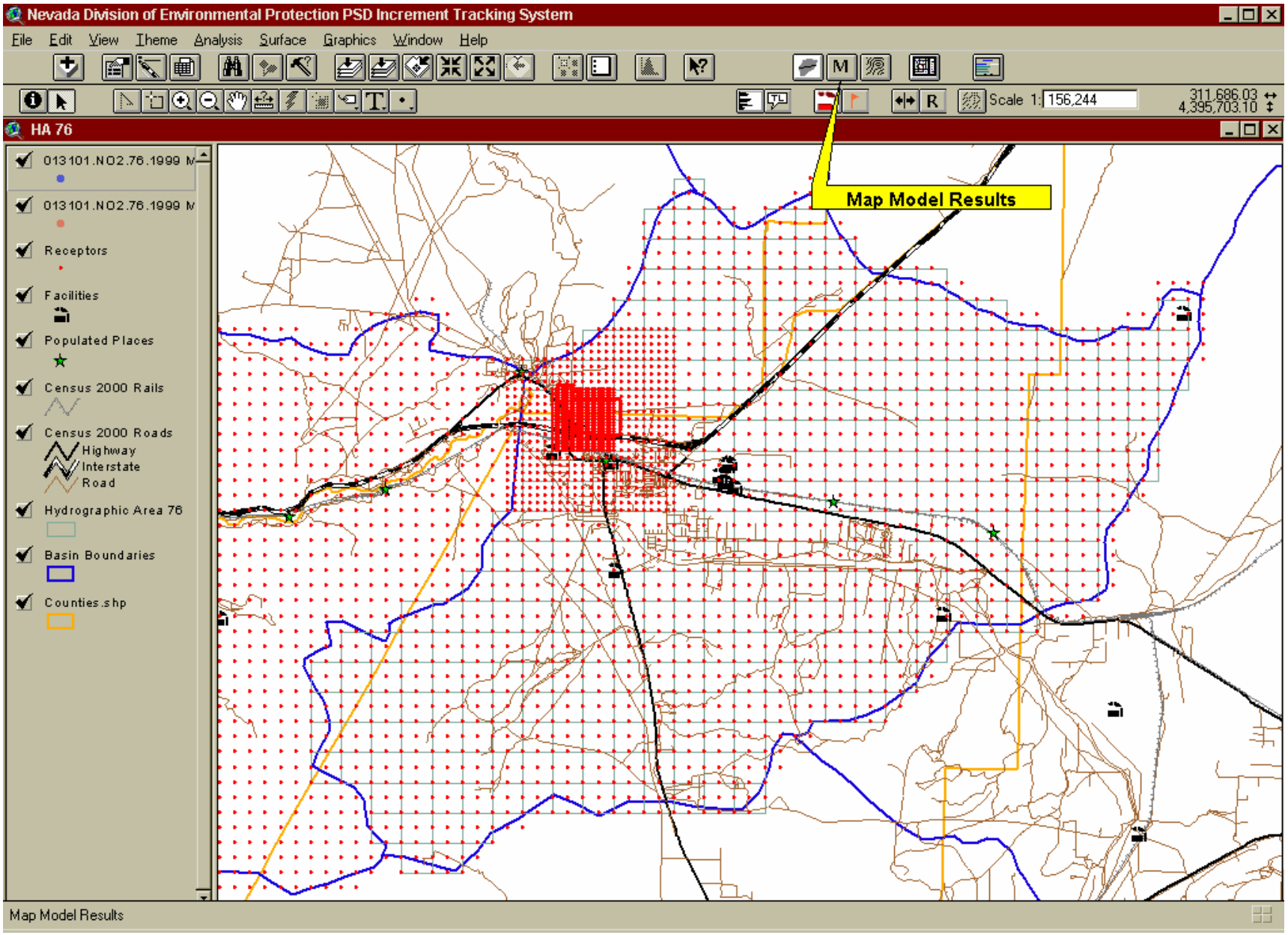


FIGURE 13
MAP MODEL RESULTS



1.7 SYSTEM INTEROPERABILITY

1.7.1 Shared Data

As previously mentioned, the Facilities theme in the ArcView component of the ITS is created dynamically from the PSD_Companies table in the Access component of the ITS by an Access ODBC link. Facilities can be added or edited within ArcView by using the appropriate tools (see sections 1.6.2 and 1.6.3) to pass updates to Access. The Receptors theme is also linked dynamically to Access receptor data in the ReceptorLU table. Receptors can be added to this table (and therefore the Receptors theme) using the tool to add receptors (see section 1.6.4). Area source emissions data are also referenced dynamically by the ArcView component of the ITS. It is available in each of the three basin Hydrographic Area themes. These data cannot be modified within ArcView. To update area source emissions, launch the Access component of the ITS. These themes are refreshed each time the ArcView component of the ITS is started, after the user returns from opening and making changes in Access, and manually by the user by pushing the Refresh Access Data button.

1.7.2 Static Data Sets

Static data sets in the ArcView component of the ITS include the base map themes and the 1-km area grid. See Attachment A for a list of these files and their metadata.

ATTACHMENT A
GIS METADATA FOR NDEP PSD STUDY

Theme Name	Shapefile Name	Description	Feature Type	Source	Survey Year	Projection	Units	Notes
Census 2000 Roads	Roads-census-utm.shp	Roads	Line	TIGER	2000	UTM 83 11	Meters	
Census 2000 Rails	Rails-census-utm.shp	Railroads	Line	TIGER	2000	UTM 83 11	Meters	
Hydrographic Area 76	Basin76-1k-grid.shp	1 kilometer grid	Poly	Derived In-house	2001	UTM 83 11	Meters	
Hydrographic Area 83	Basin83-1k-grid.shp	1 kilometer grid	Poly	Derived In-house	2001	UTM 83 11	Meters	
Hydrographic Area 85	Basin85-1k-grid.shp	1 kilometer grid	Poly	Derived In-house	2001	UTM 83 11	Meters	
Counties	Counties.shp	Nevada counties	Poly	Original data from State of Nevada		UTM 83 11	Meters	
Basin Boundaries	ha-basins.shp	Hydrographic areas	Poly	Original data from State of Nevada		UTM 83 11	Meters	
Populated Places	Populated-places.shp	Populated places in Nevada	Point	Derived from USGS GNIS		UTM 83 11	Meters	
	Study-grid.grd	Study area 30 meter USGS DEMs	Grid	USGS 30 meter DEMs		UTM 83 11	Meters	
Facilities	Event theme from Access connect	Dynamic connect to Access DB	Point	Access database		UTM 83 11	Meters	
Receptors	Event theme from Access connect	Dynamic connect to Access DB	Point	Access database		UTM 83 11	Meters	